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Training The AMT (A&P) In The New Millennium- A Reality Check

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ABSTRACT: A&P Mechanics (AMTs) play a major part in the safety of the air transportation system. The quality and quantity of training contributes directly to the effectiveness of safety initiatives among this population. As we enter the new millennium, the industry is facing several issues that will influence the direction of the training agenda.

There is a real shortage of AMTs today. Contributing factors include a robust domestic economy endowing increased operations among aviation operators. At the same time, tenured, senior AMTs are retiring in increasing numbers as forecasted. Exacerbating this is the fact that with a lively employment market, increasing numbers of AMT candidates are being lured into alternative industries. This necessarily results in a higher employee turnover rate among aviation operators. This has direct implications for safety and training issues.

Per NTSB findings, maintenance is playing a major *role* in at least 50% of major aviation incidents recently as compared to a 25% role just a few years ago. Training shortfalls are often sighted as contributing factors.

The key to successful maintenance training marketing in the millennium will be the degree to which a direct contribution to a reduction in operating costs can be demonstrated. Most training organizations have not capitalized on this opportunity. The affects of Human Factors, technology, and metrics will also be explored in new ways.

The 'Reality Check' in this presentation will manifest itself in the form of frank and open discussions of these and other issues.

INTRODUCTION

The new millennium has created in people's mind the expectation that we are entering a new era. Indeed we have, both figuratively and literally. Due to the onslaught of technology and information, now more than ever we can explore fresh ways to solve problems or effect continuous improvement in our products and services. Successful enterprises in the new century will be those that can foster an atmosphere of creativity, inventiveness, and innovation able to capitalize on the information and technology age. In a similar manor, new ways of conducting training must be examined and explored. Such exploration and examination must take place in an atmosphere of frankness and intellectual honesty.

This paper will discuss issues from the Air Carrier perspective. Before focusing exclusively on training, we need to take a critical look at several issues that will influence the discussion.

- It is estimated that by 2006, there will be a need for 155,000 A&Ps, a 13% increase from the 137,000 now employed according to the US department of Labor (Shay, Lee A.)
- There are approximately one and one third jobs for every certificated A&P today (Shay, Lee A.)
- It has been estimated that as much as 40% of A&P graduates today choose not to enter the aviation maintenance workplace (Shay, Lee A.)
- The National Transportation Safety Board said on 2/28/98 that in 1998, Part 121 and 135 operators in the US had no passenger fatalities – a first since the NTSB began keeping such records (Aviation Week)
- 80 to 85% of aviation incidents are directly attributed to human error. Per NTSB findings, maintenance is playing a major *role* in at least 50% of major aviation incidents recently as compared to a 25% role just a few years ago (Komarski, Rich)

EMPLOYMENT

First lets look at the employment situation. It's obviously a favorable market for those seeking new jobs as A&Ps (or AMTs which will be used interchangeably). Due to a prosperous domestic economy, aviation and aerospace are experiencing across the board growth. Because of this, A&Ps are in great demand for maintenance and related activities. This has created a shortage. Exacerbating this shortage is the predicted retirement of thousands of those presently employed. Corporations increasingly are implementing recruitment campaigns and establishing ties to Educational Institutions in an effort to meet their peculiar demands. This shortage has been forecasted for many years, and has been cited by educational institutions in particular as a marketing tool to attract potential students. The 'shortage' used to be cliché. But make no mistake, it's a reality today.

Is there anything else besides growth and retirements that can explain the shortfall? Why aren't more candidates flocking to the schools? An important clue is reflected by the fact that as many as 40% of graduates have chosen *not* to enter the aviation maintenance field at all. Why have so many employees who were laid off during the recession of the early 1990's chosen not to return to the industry? Why is it so easy for other industries to recruit A&Ps away from aviation? Traditional industry spokespersons have offered lists of suggested improvements to incentivize the recruitment and retention efforts aimed at this population. These include offering better training, relocation packages, support for continuing education, child care, recognition programs, retirement packages, and profit sharing among many others. Usually cloaked somewhere in the middle of these suggestions is pay.

It would be difficult to isolate another subject that elicits more emotion that the issue of pay. From union halls to corporate boardrooms, the matter receives microscopic attention. If wages

are a major answer to our questions, why don't we hear more of it from those traditional spokespersons? The reason is simple. Most spokespersons tend to be Presidents of Aviation/Aerospace Organizations or Associations. Their constituencies are usually corporate management representatives. If these spokepersons were to suggest too publicly or vocally that companies need to spend more money on wages to address recruitment and retention problems, their members would predictably seek to oust that President from their Association. The result is that this matter does not receive the public support, discussion, or press it deserves. Pay ***is*** the issue. If the proposed FAR 66 is adopted, the already expensive costs of attending AMT school will rise even more. Potential new students will perform the cost/benefit analysis and predictably decide to enter alternative industries. This will compound the shortages unless the pay issue is honestly addressed.

Corporations performing the needed painful wage examination should not necessarily be viewed as being too frugal. Most of these companies operate in the global marketplace and have to complete against foreign corporations whose cost structures make it **a very real** challenge for these domestic companies to be competitive. Additionally, they must make enough profits to satisfy owners or stockholders. The aviation sector of business already has a reputation among lending institutions and financiers for not providing the same level of return on investment as other types of businesses. This makes aviation a less attractive customer of loans that could otherwise be used to finance growth, expansion, and increased employment. On the other hand, if wages are raised too high, thereby hurting ones competitive position, the result could be loss of financing and growth, possible downsizing, and resultant layoffs; a pyrrhic victory indeed. Associations, Unions, and Corporations need to engage the wage issue more publicly in order to realistically address the shortages. At the same time, in order for the public debate to have productive results, all sides have to sincerely acknowledge each others goals and needs. The old methods of union or corporate leaders publicly posturing for their respective constituencies simply will not lead to satisfactorily addressing the pay problem.

A profound yet challenging question is this: *Can increased wages lower your costs and make you more competitive?* To answer in the positive, you must necessarily understand and acknowledge that the recruitment and retention problem has resulted in the following:

- The turnover rate among this employee population has increased
- The average tenure (seniority) of these employees has decreased

If you can acknowledge these phenomenon, you will also likely have experienced the following:

- Because of turnover, you are spending more time and money in repetitive training for new groups of employees
- Because of a lower average tenure of the workforce (**less experience**) you'll encounter:
    - Longer average times for the performance of a maintenance task. This may result in more delays, cancellations, and missed aircraft delivery times out of scheduled maintenance checks

- Increased repeat pilot-reported writeups because the problem was not isolated the first time. This usually results in the natural observation that additional training will be required
- Increased use of expendable materials used, more spares needed, and higher volumes of parts in the repair cycle.

All of these result in **higher costs** for operators. On the other hand, if you believe that higher wages will do much to attenuate the recruitment and retention problem, then it's easy to see how an investment in higher pay will greatly reduce the aforementioned costs. You'll attract employees who want to stay, turnover will go down, and gradually experience will return to comfortable levels.

It seems like an easy analysis. If so, why hasn't the argument been used successfully by management? The answer has it's roots in the following:

- The clash between our accounting systems and our inability to accurately measure, quantify, and attribute the additional costs to the correct root problem
- A financial and accounting culture that wants to see immediate results following any investment

If you are contemplating raising wages, your accountant can within minutes tell you the result that will be reflected on the bottom line. You must be prepared to argue that you are experiencing higher costs as a result of not having higher wages. To argue persuasively with your accountant will require that you arm yourself with correct information. This necessarily requires that you have a data collection system that can measure and quantify the additional costs being experienced. A more difficult task is *attributing those higher costs to the right cause*. Lets examine an example being experienced by a large, mature airline, which we'll refer to again in this paper as 'Mature Airlines'. Suppose you track the Mean Time Between Removals (MTBR) for the parts in your fleet of aircraft. You've noticed in the last few years a steady degradation in the overall MTBR rates (there are more removals). This of course means that your average cost of maintenance per flight hour has risen and you have probably experienced a corresponding rise in delays and cancellations charged to maintenance. Additionally, you have had to purchase and increase the amount of spares in inventory to keep pace with the increased removals, and of course your repair and overhaul costs for the removed units has similarly increased. If your system can track MTBR, you likely have a system that can measure and quantify these costs accurately. A measure of your management skill however, comes in the analysis of those numbers. Traditionally, a problem like MTBR is examined as follows: Is there a reliability problem with several components causing the overall rise in removals? Your supplier insists that the *failure* rate remains steady and suggests that your system be modified to track Mean Time Between Failures (MTBF), or that you track the unconfirmed removal rate. In other words the supplier is saying that you are increasingly sending them good units. These parts are likely out of warranty, and 'No Trouble Found' cost is not cheap. The comparison between MTBR and MTBF could be enlightening.

Alternatively, the particular fleet you are tracking is aging. Is the MTBR problem just a reflection of the natural and progressive degradation of the systems on the aircraft? Perhaps there has been a change in the purchasing pattern for replacement parts; are you increasingly having to buy surplus parts instead of new parts? These and other issues can weave a complex mosaic that does not lend itself to easy analysis. These also represent the historical method of looking at this type of problem. But how about the personnel performing the maintenance? Have you tried calling HR and finding out if there has been any demographic changes in the last few years? Has the average tenure of the population (and thus their experience) gone down? Is HR having a difficult time recruiting? If HR answers yes, then you must be prepared to list it as a causal element of your increased costs, and have the integrity to attribute the increase in costs to it. *In fact, if you could graph the declining seniority average, the increasing turnover rate, and the increasing cost of maintenance per hour on the same sheet, the results might be startling.* The problem is that many operators simply don't have the infrastructure to gather such sophisticated data-you can not attribute information that you have not gathered. The result? Your accountant wins. You'll have to be pretty powerful within your company to get them to dedicate financial resources (for wage increases) based on your professional observations or intuition.

On the other hand lets assume that management engages a successful campaign to increase wages. HR starts to attract more AMTs, your turnover rate starts to decline, the seniority average starts climbing again. You see a plateauing, then declines in maintenance costs per flight hour. How long will it take to see a clear payback of the investment in increased wages as just described? <u>It will take many years.</u> Any industrial engineer could have plotted and predicted this progress. *The problem maintenance management may face is whether or not its present corporate management is sufficiently long-range-minded to make a wage investment that has such a lengthy payback period.* If corporate management is driven by short term goals and vision, and is not investing in its infrastructure for long term growth, chances are your arguments for the wage investment will fall on deaf ears.

The reasons for the shortage of AMTs is certainly multi faceted. The scenarios just discussed are generalizations, yet they are reflective of operational realities and should appeal to our common sense. The wage issue is **not** an exclusive answer or reason for the shortage, *but it should not be minimized from discussion to the degree it has in current public debate.*

SAFETY

The shortage of AMTs has forced operators to make changes in their staffing. An interview was held recently with a modest sized manufacturer of General Aviation Aircraft. The President stated he preferred having more A&Ps on his staff, but that as soon as they gained experience, they were lured away by the airlines. He simultaneously raised wages and made the decision to keep the ratio of his A&P to non-A&P employees low. He stated that the result is a steadier workforce with lower turnover. How about the airlines? In some places the A&Ps are being moved out from the

support shops (components and accessories for example) to the hangar or flight line, and the requirement for an A&P in those shops is being dropped. For flight line avionics personnel, some operators have substituted an FCC license for an A&P. The result is a decrease in the ratio between A&P to non A&P mechanics. On close examination of the FARs, relatively few key positions actually require an A&P, so a decrease in the ratios as described can not be contested from the FAR point of view as long as the those few key positions continue to be staffed by appropriately certificated airmen. From General Aviation to Air Carriers, the declining A&P ratios are primarily reflective of the existing and projected shortages of these professionals. The declining ratios go hand in hand with the higher employee turnover rate, and lower average seniority/tenure trends. Corporate management should not be lulled into thinking that these problems will disappear soon. Continued growth in the industry will exacerbate and prolong these challenges. According to the Department of Transportation (FAA Press Release APA 37-99), 1998 saw the seventh consecutive year of growth with projections of similar expansion forecasted through 2010. The sobering question to ask is at what point does a given declining ratio for a particular operator start to contribute to deteriorating quality and possibly a compromise in safety?

Two safety statistics have been cited that seemingly conflict with each other:

- 80 to 85% of aviation incidents are directly attributed to human error. Per NTSB findings, maintenance is playing a major role in at least 50% of major aviation incidents recently as compared to a 25% role just a few years ago (Komarski, Rich)

Yet we are reading articles that say:

- The National Transportation Safety Board said on 2/28/99 that in 1998, Part 121 and 135 operators in the US had no passenger fatalities-a first since the NTSB began keeping such records (Aviation Week)

Lets look at each separately. That there were no fatalities is certainly a milestone indicative of a positive trend. We can attribute it to several reasons including: Increased surveillance by the FAA on 'troubled' operators, increased use of NASIP (National Aviation Safety Inspection Program), and RASIP (Regional Aviation Safety Inspection Program) inspections by the FAA, implementation of CRM (Cockpit Resource Management) increased surveillance of substantial maintenance providers. DoD (Dept of Defense) inspections of some carriers, the industries embracing of Quality Standards such as CASE (Coordinating Agency for Supplier Evaluation), ASA-100 (Airline Suppliers Association), and AS 9000 (the Aerospace version of ISO 9000). Certainly technology such as GPS, TCAS, and EGPWS have contributed to the reduction in fatalities. Additionally, new coalitions have been formed between Government and Industry to effect solutions to safety issues. Also, among enlightened corporate leadership there has been the realization of the connection between Quality and Safety; what this means is that operators are increasingly aware that the public is demanding a quality, safe product. So quality and safety have become a competitive advantage and economic incentive. This optimism

should not lead us to complacency however.

As noted, maintenance is playing a major role in at least 50% of major aviation *incidents;* the key difference between the two aforementioned statistics is that *accidents* lead to fatalities (see NTSB Part 830 for the definition of 'accident' and 'incident'). We can not let our guard down because there were no fatalities among 121 or 135 operators last year, rather we should be alarmed that there has been a 100% increase in the contributions that maintenance has exhibited in incidents (from 25% to 50%)! Some observers would argue that with a trend like this it is only a matter of time before we see maintenance increasingly cited as contributing to fatality causing *accidents.* We cannot gamble on the validity of this observation. Rather, now is the time to search for any assets we can bring to bear to address the disturbing rise in maintenance related incidents, the problems created by the shortage of AMTs, and the declining ratios of AMTs to non-AMT employees. The answer is training.

TRAINING

Lets examine how training departments will be used to address the problems we have been discussing.

As the ratios of AMTs to non-AMT employees decreases, this means that the workforce will increasingly become populated with mechanics that have not undergone the rigorous training and testing that AMTs experience. Operators must ensure that work produced by such a work force meets aircraft quality standards. Training departments will have to write training plans that impart a more basic level of knowledge to these employees. *Temporarily*, additional inspection requirements, more supervision, or more 'lead' or 'crewcheif' positions should be brought into play to assure quality standards are being met before the product is released for operational consumption. The degree to which these assets are 'temporary' will depend largely on the quality and quantity of training the employees receive.

You may have a hangar or flight line full of A&Ps, but what is their average seniority/tenure? Is it low compared to recent years due to turnover, growth, and retirements? As previously suggested, the operator is more than likely experiencing higher operating costs per flight hour. Training can make a difference here. A fundamental questions to ask then, is how intelligently are your training assets being used?

Lets go back to the Mature Airlines example. The overwhelming majority of the training being performed is directly tied to safety. This may include taxi, towing, run-up, borescoping, general familiarization, ETOPs maintenance, CAT IIIA avionic systems maintenance, and RII for example. Of course these are necessary for a safe operation. In addition to safety however, how much of all the training courses being offered can proclaim that its purpose is to drive down costs? *The key to successful maintenance training marketing in the millennium will be the degree to which a direct contribution to reduction in operating costs can be demonstrated.* Earlier we described a situation at Mature Airlines with increasing maintenance costs. There was increased repeat PIREPS (pilot reports) due to the problem not being fixed the first time, repair stations or shops reporting an

increase in No-Trouble-Found rates (MTBR is decreasing while MTBF remains constant or is increasing), your purchasing department is reporting increased costs for repairing those No-Trouble-Found units, and the inventory organization is asking that you increase the spare parts pool to keep up with more lively rotable action. Where is the training department in all this? Are they 'invited' to become involved only after the situation reaches a critical stage with budget comptrollers waving red flags at the hemorrhaging costs? The truth is that most training departments are traditionally reactive rather than pro-active. This may not be by their own choice; it is nonetheless an operational reality for most training departments in many companies. In the typical 'reactive' model, they are challenged to design a new training course following an FAA inspection, a customer audit, or a Self Disclosure. *No training department can realistically be expected to contribute programs designed to reduce operating costs unless it is purposely a pro-active organization.* What would it take to transition to a pro-active organization?

Lets perform an audit to assess the Reactive or Pro-Active posture of the training department. Most companies have enclaves of management teams that meet regularly. At Mature Airlines, there are engineering, purchasing, inventory control, HR, Flight line maintenance, QA, planning, and Overhaul base maintenance teams. Are management members of the training department considered a part of those teams? Is the training department copied on critical reports? Are they called upon routinely to participate in exploratory or problem solving sessions? It should become obvious to you after answering these questions where you fall in the 'Reactive-Pro active' spectrum. You may cynically think that your training department management team would be tied up in meetings all the time. Perhaps. But such cynicism will be quickly vanquished the first time you are able to demonstrate to the corporate team that your training efforts directly lead to a reduction in operating costs. The fundamental point here is that in order to be pro-active, you need real-time access to information as it develops into patterns that are adding costs to the operation.

Lets look at a pro active training department at Mature Airlines and the MTBR problem. Because of information from HR, the Director of Training has already alerted his team to be on the lookout for ways to address any problems that arise because the workforce has become younger (less seniority or tenure) and less experienced. Training has also read the reports from engineering that MTBR rates are starting to decline. At a budget review for the entire Technical Services division (sometimes called Maintenance and Engineering) of Mature Airlines, the Director hears that the average cost per flight hour is on the rise. *Now* the training department may be in a position to pro actively realize that *an opportunity exists*. After additional analysis with other organizations, the training department has itemized the top five offending components. This was based on examination of MTBF rates, delay and cancellation causes repair costs, MEL trends (Minimum Equipment List), and MTBF data from the repair shops. Further, engineering was able to identify the specific components in the system that usually fixed the pilot's write up. The training

department is now armed with data to produce a custom made training program that teaches the mechanics how to more effectively troubleshoot the targeted system. You are even able to share with them the data showing the units that usually were the cause of the failure in that aircraft system. This is particularly helpful information when fixing a plane that has a quick turn around time at the gate. Soon you notice that the MTBR rates are starting to climb for the targeted components, leading to collateral decreases in costs. Best of all, because of these actions you also contributed to a safer operation. This may seem like a simplistic, 'perfect world', and optimistic example. Make no mistake: it is doable when corporate management has the vision for a pro-active training department. Further, it will be the model for those operators seeking new ways to be more competitively using their assets more wisely. The primary function of training departments must always be safety, but global competitive pressures make it clear that reducing operating costs must also become the new rallying cry for successful training departments in the new millennium.

AIRCRAFT TECHNOLOGY

Another challenge facing training departments in the next century is technology. Advances in aircraft systems technology have skyrocketed in the last 30 years. Mechanics can no longer think of a system as independent parts that are isolated by ATA chapter. It seems that almost every system has a digital microprocessor controlled blackbox that exchanges information with other systems via data buses; real systems integration. Not only must you carefully track Airwothiness Directive (AD) and Service Bulletin (SB) configurations, but also software revision levels as well. The potential for 'future shock' to set in is real. Of course training is always tasked with introducing new systems or aircraft. With the logarithmic increase in technology and complexity, is there another way that training should be imparted to mechanics? Flight departments long ago discovered the value of hands on training. All the class room training in the world does not equate to a proficient pilot. Only after being placed in a plane or simulator for many hours, being put through the paces, and shown the capabilities and limitations of the aircraft do we begin to consider a pilot proficient. For flight departments, if a ratio could be devised of hands on training to classroom training we'd see that the ratio was high. But high compared to what? It's high compared to the traditional training profile for mechanics. Earlier *we stated that all the classroom training in the world does not equate to a proficient pilot. Why do we expect any less for mechanics?* Most persons would agree with this observation. The problem however, is one of economics. The prevailing thought is that maintenance simulators and access to real aircraft for training purposes is expensive. Further, the direct contribution to safety is much greater for pilots than for maintenance, so the additional investment in training aids is not made. This prevailing thought must be challenged in light of the operational environment that maintenance organizations will find themselves in the coming millennium. We have already examined those factors. The environment will include increasingly complex and technologically sophisticated systems,

high employee turnover rates, lower experience levels (seniority/tenure), increased roles in incidents, and fewer numbers of certificated mechanics. The military has no choice but to use higher levels of hands- on training. Their mechanics come to them with zero experience and no credentials (A&P, FCC) at all. They make ample use of mock-ups, maintenance simulators, and they schedule aircraft for maintenance training. Some of the most advanced systems in civilian aircraft today first found their successful use in the military. We can not overlook their training model.

TRAINING TECHNOLOGY

Can technology help training? Of course it can. The problem is that in the maintenance arena, the application of technology is woefully underdeveloped. Why has this been so? Training organizations, when viewed individually, really are very small business enclaves. To potential manufacturers of maintenance training aids, the market seems limited indeed. These manufacturers understandably will not invest in research and development for a protracted market. Plainly stated, the typical training organization's purchasing power is simply too anemic to support development of breakthrough technological applications being exhibited in other fields. To broaden the purchasing power base, operators should look to pooling their maintenance training aid purchases. Several newly formed airline alliances could facilitate the process. Trade associations could also act as brokers and facilitators.

HUMAN FACTORS

Cockpit Resource Management (CRM) and Human Factors studies have been widely credited as a major contributor to today's safety levels. The FAA and industry have cooperated successfully in bringing these concepts to the maintenance arena. Human Factors are being taught as *stand alone* courses in many companies today. The 'dirty dozen' casual reasons for incidents and accidents identified by these studies is being given careful thought by maintenance personnel at all levels. In the next millenium, Human Factors ideas must go beyond the stand alone classroom training being imparted today. *Every* training course must be rethought to include preventative actions and discussions that will preclude accidents and incidents from occurring based on lessons learned from Human Factors studies.

RECOMMENDATIONS

The following recommendations have been alluded to in many sections of this paper. Here they are plainly put forth in summary form, in no particular order.

1) INTEGRATE HUMAN FACTORS LESSONS INTO EVERY MAINTENANCE COURSE. For example, you are teaching an RII (Required Inspection Items) course. Generally, an RII item is a maintenance task whose performance is so critical, that the operator requires the work be inspected an countersigned by a second mechanic or inspector. This may include flight control rigging, engine changes, gear retractions etc. Two of the 'Dirty

Dozen' safety issues identified by Human Factors studies as casual reasons for incidents and accidents are the affects of work 'pressure' and 'lack of assertiveness'. Certainly at least these two could be skillfully weaved into the RII course plan to raise mechanic's awareness levels of their affects. Most professional training organizations have course plans, agendas, syllabi, or checklists used to develop and outline a course. These checklists or outlines should include a conspicuous step that is attested to by the course developer stating that Human Factor elements have been reviewed and embedded into the course material as necessary.

2) NEW COURSES UNDER DEVELOPMENT MUST INCLUDE A REVIEW THAT OUTLINES ITS POTENTIAL TO REDUCE OPERATING COSTS. Most professional training departments have a formal process to approve of new training courses. As suggested in recommendation 1, checklists or outlines should include a conspicuous step that is attested to by the course developer stating the possible or intended potential to reduce operating costs. The reasons for this have already been discussed on page 6 of this paper.
3) INCREASE THE AMOUNT OF HANDS-ON TRAINING. As we reviewed on page 7, there are compelling reasons to increase the amount of hands-on training received by mechanics. Classroom training by itself will not guarantee a proficient AMT. Training organizations should start to track the ratios between hands-on and classroom training for a given course, and list the ratio on course plans or outlines for tracking purposes. For example, you are teaching an engine borescoping course. There is 8 hours of classroom followed by 2 hours at an engine performing the task. The ratio is 2/8 or .25. After all the ratios are logged for all the courses, you'll want to track the overall average, and take steps to purposely and methodically increase that average.
4) HR DEPARTMENTS MUST BEGIN TO TRACK THE FOLLOWING

- Ratios of A&P to non-A&P mechanics in the maintenance workforce
- The Turnover rate among the mechanic population
- The past, present and future projected average seniority/tenure of mechanics

The degree to which these figures show a negative trend *will* influence training requirements, spares requirements, repair costs, delays and cancellations, MEL trends, and average maintenance costs per hour. For these reasons it is vital that maintenance management have these figures for planning purposes.

5) THE INDUSTRY SHOULD AGREE ON A STANDARD

METRIC TO MEASURE THE AMOUNT OF TRAINING MECHANICS ARE RECEIVING. Many, but not all organizations track the amount of training they are imparting. For those that do, it may be expressed as the total hours conducted, the average amount of hours per employee per year, or the amount of classes given. For simplicity, the universal measure should be the average amount of hours per employee per year.

6) FOR STUDY AND SURVEILLANCE PURPOSES, THE FAA SHOULD BEGIN TO TRACK INDIVIDUAL OPERATOR'S FIGURES FOR: A) THE AVERAGE AMOUNT OF TRAINING HOURS PER MECHANIC PER YEAR. B) THE TURNOVER RATE. C) THE AVERAGE SENIORITY/TENURE TREND. D) THE RATIO OF AMT TO NON-AMT EMPLOYEES. E) THE RATIO OF HANDS ON TO CLASSROOM TRAINING. Recently the FAA published two bulletins titled "Monitoring Operators During Periods Of Growth Or Change", in bulletins HBAW 98-21 and HBAT 98-36. These bulletins provide excellent guidance to FAA Inspectors on judging the adequacy of an Air Carrier's operation during periods of growth and change. In that same spirit, some of these measurements should be tracked as well. It is important to note that standards *do not* exist to properly judge the adequacy of any of the proposed metrics. Currently, these metrics could serve as leading indicators, particularly when they are trending negatively, that the operator may be about to experience some difficulties and thus require increased surveillance for the public good. To properly size up the surveillance challenge, consider that since the industry was deregulated in 1978 there have been 120 airlines file for bankruptcy (Freiberg). Regulators need quantitative data that will make their decision making objective, rather than subjective. That same quantitative data serves as the basis for intelligent allocation of Inspector resources; place your assets where they are needed when they are needed, not after the fact. There have been indications that some airlines have been reluctant to invest in maintenance training due to the high turnover rate in the mechanic ranks (Proctor). If so, how could you objectively judge the minimum amount of training necessary to ensure safety? *In the long term the accumulation of data from some of these metrics should*

start to form a 'best practice' basis, and must be correlated between healthy and unhealthy operators.

7) IN ORDER TO ENCOURAGE DEVELOPMENT OF TECHNOLOGICALLY ACVANCED TRAINING AIDS, OPERATORS WILL HAVE TO START TO POOL THEIR TRAINING NEEDS IN SUCH A WAY THAT THE INDUSTRY'S PURCHASING POWER IS MAGNIFIED. There are several global airline alliances that should start to look at sharing their maintenance training needs, and pooling their training purchases. In the absence of such alliances, trade associations should explore avenues to similarly pool their member's needs. Is the cost of such training aids a concern? How about considering fractional ownership? If not, how about buying outright and then contracting out use of such aids to other companies in the same way as flight simulators? It could serve as a revenue generator for maintenance training organizations. Historically, training organizations for Flight departments and Maintenance departments have operated (and purchased) independently. This too has diluted the purchasing power of the maintenance training organization, further setting back research and development efforts. Imagine the impact if a six member airline alliance could cohesively and uniformly speak with one purchasing voice for their collective Flight and Maintenance training needs? The purchasing power could be formidable and at the same time attractive enough for manufacturers to address through development and marketing of technologically advanced training aids.

The connection between safety and quality is indisputable. Every quality standard has at its core the idea that training is fundamental to success. Enlightened management will seize upon it as a tool to become more competitive. Training contributes to quality which contributes to safety, which contributes to a marketable characteristic. This paper has attempted to bring into focus several issues impacting training discussions. Along with observations have come recommendations. The industry has been blessed with growth and prosperity, but is clearly struggling with many issues. The public debate on these issues must be balanced by vision, clarity, and frankness; an honest attempt has been made to include these in this work.

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